JAN 7 195

Charles Singer

9D

Rep. 11
15

Taf

ig. 4

A
SHORT ACCOUNT
OF THE
CAUSE OF THE DISEASE IN CORN,
CALLED BY FARMERS
THE BLIGHT, THE MILDEW, AND THE RUST.

By SIR JOSEPH BANKS, BART.

B 2186

THE SECOND EDITION, WITH ADDITIONS.

AND

A LETTER TO SIR J. BANKS,
ON THE ORIGIN OF THE BLIGHT,
AND ON THE MEANS OF
RAISING LATE CROPS OF GARDEN PEASE.

By T. A. KNIGHT, Esq.

LONDON:
PRINTED FOR J. HARDING, 36, ST. JAMES'S-STREET,

1806.

ON THE

BLIGHT IN CORN.

BOTANISTS have long known that the Blight in Corn is occasioned by the growth of a minute parasitic fungus or mushroom on the leaves, stems, and glumes of the living plant. Felice Fontana published in the year 1767, an elaborate account of this mischievous weed*, with microscopic figures, which give a tolerable idea of its form; more modern botanists† have given figures both of corn and of grass affected by it, but have not used high magnifying powers in their researches.

---

* Observazioni sopra la Ruggine del Grano. Lucca, 1767, 8vo.

† Sowerby's English Fungi, Vol. II. Tab. 140, Wheat, Tab. 139. Poa aquatica.

Agriculturists do not appear to have paid, on this head, sufficient attention to the discoveries of their fellow-labourers in the field of nature; for though scarce any English writer of note on the subject of rural economy has failed to state his opinion of the origin of this evil, no one of them has yet attributed it to the real cause, unless Mr. Kirby's excellent papers on some diseases of corn, published in the Transactions of the Linnæan Society, are considered as agricultural essays.

On this account it has been deemed expedient to offer to the consideration of farmers, engravings of this destructive plant, made from the drawings of the accurate and ingenious Mr. Bauer, Botanical Painter to his Majesty, accompanied with his explanation, from whence it is presumed an attentive reader will be able to form a correct idea of the facts intended to be represented, and a just opinion whether or not they are, as is presumed to be the case, correct and satisfactory.

In order, however, to render Mr. Bauer's explanation more easy to be understood, it is necessary to premise, that the striped appearance of the surface of a straw which may be seen with a common magnifying glass, is caused by alternate longitudinal partitions of the bark, the one imperforate, and the other furnished with one or two rows of pores or mouths, shut in dry, open in wet weather, and well calculated to imbibe fluid whenever the straw is damp*.

---

* Pores or mouths similar to these, are placed by nature on the surface of the leaves, branches, and stems, of all perfect plants; a provision intended no doubt to compensate, in some measure, the want of loco-motion in vegetables. A plant cannot when thirsty go to the brook and drink, but it can open innumerable orifices for the reception of every degree of moisture, which either falls in the shape of rain and of dew, or is separated from the mass of water always held in solution by the atmosphere; it seldom happens in the driest season, that the night does not afford some refreshment of this kind, to

By these pores, which exist also on the leaves and glumes, it is presumed that the seeds of the fungus gain admission, and at the bottom of the hollows to which they lead, (See Plate, fig. 1, 2.) they germinate and push their minute roots, no doubt (though these have not yet been traced) into the cellular texture beyond the bark, where they draw their nourishment, by intercepting the sap that was intended by nature for the nutriment of the grain; the corn of course becomes shrivelled in proportion as the fungi are more or less numerous on the plant; and as the kernel only is abstracted from the grain, while the cortical part remains undiminished, the proportion of *flour to bran* in blighted corn, is always reduced in the same degree as the corn is made light. Some corn of this year's crop* will not yield a stone of flour from a sack of wheat; and it is not impossible that in

---

restore the moisture that has been exhausted by the heats of the preceding day.

* This was written, January 1805.

some cases the corn has been so completely robbed of its flour by the fungus, that if the proprietor should choose to incur the expense of thrashing and grinding it, bran would be the produce, with scarce an atom of flour for each grain.

Every species of corn, properly so called, is subject to the Blight; but it is observable that spring corn is less damaged by it than winter, and rye less than wheat, probably because it is ripe and cut down before the fungus has had time to increase in any great degree.—Tull says that "white cone or bearded "wheat, which hath its straw like a rush, "full of pith, is less subject to Blight "than Lammas wheat, which ripens a "week later." See page 74. The spring wheat of Lincolnshire was not in the least shrivelled this year, though the straw was in some degree infected: the millers allowed that it was the best sample brought to market. Barley was in some places considerably spotted, but as the whole of the stem of that grain is naturally enveloped in the hose or basis of the leaf, the fungus can in no case gain admittance to the straw; it is however to be observed that barley rises from the flail lighter this year, than was expected from the appearance of the crop when gathered in.

Though diligent inquiry was made during the last autumn, no information of importance relative to the origin or the progress of the blight could be obtained: this is not to be wondered at; for as no one of the persons applied to had any knowledge of the real cause of the malady, none of them could direct their curiosity in a proper channel. Now that its nature and cause have been explained, we may reasonably expect that a few years will produce an interesting collection of facts and observations, and we may hope that some progress will be made towards the very desirable attainment of either a preventive or a cure.

It seems probable that the leaf is first infected in the spring, or early in the summer, before the corn shoots up into straw, and that the fungus is then of an orange colour*; after the straw is become yellow, the fungus assumes a deep chocolate brown; each individual is so small that every pore on a straw will produce from 20 to 40 fungi, as may be seen in the plate, and every one of these will no doubt produce at least 100 seeds; if then one of these seeds tillows out into the number of plants that appear at the bottom of a pore in the plate, fig. 7, 8, how incalculably large must the increase be! A few diseased plants scattered over a field must very speedily infect a whole neighbourhood, for the seeds of fungi are not much heavier than air, as every one who has trod upon a ripe puff-ball must have observed, by seeing the dust, among which is its seed, rise up and float on before him.

---

* The Abbé Tessier in his Traité des Maladies des Grains, tells us, that in France this disease first shows itself in minute spots of a dirty white colour on the leaves and stems, which spots extend themselves by degrees, and in time change to a yellow colour, and throw off a dry orange coloured powder. pp. 201, 340.

How long it is before this fungus arrives at puberty, and scatters its seeds in the wind, can only be guessed at by the analogy of others; probably the period of a generation is short, possibly not more than a week in a hot season: if so, how frequently in the latter end of the summer must the air be loaded as it were with this animated dust, ready, whenever a gentle breeze accompanied, with humidity, shall give the signal to intrude itself into the pores of thousands of acres of corn. Providence, however, careful of the creatures it has created, has benevolently provided against the too extensive multiplication of any species of being; was it otherwise, the minute plants and animals, enemies against which man has the fewest means of defence, would increase to an inordinate extent; this, however, can in no case happen, unless many predisposing causes afford their combined assistance. But for this wise and beneficent provision, the plague of slugs, the plague of mice, the plagues of grubs, wire-worms, chafers, and many other creatures whose power of multiplying is countless as the sands of the sea, would, long before this time, have driven mankind, and all the larger animals, from the face of the earth.

Though all old persons who have concerned themselves in agriculture remember the Blight in Corn many years, yet some have supposed that of late years it has materially increased; this however does not seem to be the case. Tull, in his Horse-hoeing Husbandry, p. 74, tells us, that the year 1725 "was a year of "Blight, the like of which was never be-"fore heard of, and which he hopes may "never happen again;" yet the average price of wheat in the year 1726, when the harvest of 1725 was at market, was only 36*s.* 4*d.* and the average of the five years of which it makes the first, 37*s.* 7*d.* —1797 was also a year of great Blight; the price of wheat in 1798 was 49*s.* 1*d.* and the average of the five years, from 1795 to 1799, 63*s.* 5*d.**

The climate of the British Isles is not the only one that is liable to the Blight in corn; it happens occasionally in every part of Europe, and probably in all countries where corn is grown. Italy is very subject to it, and the last harvest of Sicily has been materially hurt by it. Specimens received from the colony of New South Wales, show that considerable mischief was done to the wheat crop there, in the year 1803, by a parasitic plant, very similar to the English one.

---

* The scarcity of the year 1801, was in part occasioned by a mildew, which in many places is said to have attacked the plants of wheat on the S. E. side only, but was principally owing to the very wet harvest of 1800; the deficiency of wheat at that harvest, was found, on a very accurate calculation, somewhat to exceed ¼th, but wheat was not the only grain that failed, all others, and potatoes also, were materially deficient. This year the wheat is probably somewhat more damaged than it was in 1800, and barley somewhat less than an average crop, every other article of agricultural food is abundant, and potatoes one of the largest crops that has been known; but for these blessings on the labour of man, wheat must before this time have reached an exorbitant price.

It has been long admitted by farmers, though scarcely credited by botanists, that wheat in the neighbourhood of a barberry bush seldom escapes the Blight. The village of Rollesby in Norfolk, where barberries abound, and wheat seldom succeeds, is called by the opprobrious appellation of Mildew Rollesby. Some observing men have of late attributed this very perplexing effect to the farina of the flowers of the barberry, which is in truth yellow, and resembles in some degree the appearance of the rust, or what is presumed to be the Blight in its early state.

It is, however, notorious to all botanical observers, that the leaves of the barberry are very subject to the attack of a yellow parasitic fungus, larger, but otherwise much resembling, the rust in corn.

Is it not more than possible, that the parasitic fungus of the barberry and that of wheat are one and the same species, and that the seed transferred from the barberry to the corn, is one cause of the disease? Misletoe, the parasitic plant with which we are the best acquainted, delights most to grow on the apple and hawthorn, but it flourishes occasionally on trees widely differing in their nature from both of these: in the Home Park, at Windsor, misletoe may be seen in abundance on the lime trees planted there in avenues; as likewise at Cobham Hall, near Gravesend, the seat of the Earl of Darnley; at Anchorwick, near Staines, it grows on the Carolina poplar. If this conjecture is founded, another year will not pass without its being confirmed by the observations of inquisitive and sagacious farmers.

It would be presumptuous to offer any remedy for a malady, the progress of which is so little understood; conjectures, however, founded on the origin here assigned to it, may be hazarded without offence.

It is believed* to begin early in the spring, and first to appear on the leaves of wheat in the form of rust, or orange-coloured powder; at this season, the fungus will, in all probability, require as many weeks for its progress from infancy to puberty, as it does days during the heats of autumn; but a very few plants of wheat, thus infected, are quite sufficient, if the fungus is permitted to ripen its seed, to spread the malady over a field, or indeed over a whole parish.

---

* This, though believed, is not dogmatically asserted, because Fontana, the best writer on the subject, asserts that the yellow and the dark-coloured Blight are different species of fungi.

The chocolate-coloured Blight is little observed till the corn is approaching very nearly to ripeness; it appears then in the field in spots, which increase very rapidly in size, and are in calm weather somewhat circular, as if the disease took its origin from a central position.

May it not happen, then, that the fungus is brought into the field in a few stalks of infected straw, uncorrupted among the mass of dung laid in the ground at the time of sowing? it must be confessed, however, that the clover leys, on which no dung from the yard was used, were as much infected last autumn as the manured crops. The immense multiplication of the disease in the last season, seems, however, to account for this; as the air was no doubt frequently charged with seed for miles together, and deposited it indiscriminarely on all sorts of crops.

It cannot, however, be an expensive precaution to search diligently in the spring for young plants of wheat infected with the disease, and carefully to extirpate them, as well as all grasses; (for several are subject to this or a similar malady) which have the appearance of orange-coloured or of black stripes on their leaves, or on their straw; and if experience shall prove, that straw can carry the disease with it into the field, it will cost the farmer but little precaution to prevent any mixture of fresh straw from being carried out with his rotten dung to the wheat field.

In a year like the present, that offers so fair an opportunity, it will be useful to observe attentively whether cattle in the straw yard thrive better or worse on blighted than on healthy straw. That blighted straw, retaining on it the fungi that have robbed the corn of its flour, has in it more nutritious matter than clean straw which has yielded a crop of plump grain, cannot be doubted; the question is, whether this nutriment in the form of fungi does, or can be made to agree as well with the stomachs of the animals that consume it, as it would do in that of straw and corn.

. It cannot be improper in this place to remark, that although the seeds of wheat are rendered, by the exhausting power of the fungus, so lean and shrivelled that scarce any flour fit for the manufacture of bread can be obtained by grinding them, these very seeds, will, except, perhaps, in the very worst cases*, answer the purpose of seed corn as well as the fairest and plumpest sample that can be obtained, and, in some respects better; for as a bushel of much blighted corn will contain one third at least more grains in number than a bushel of plump corn, three bushels of such corn will go as far in sowing land, as four bushels of large grain*.

---

* 80 grains of the most blighted wheat of the last year, that could be obtained, were sown in pots in the hothouse; of these, seventy-two produced healthy plants, a loss of 10 per cent. only.

The use of the flour of corn in furthering the process of vegetation, is to nourish the minute plant from the time of its developement till its roots are able to attract food from the manured earth; for this purpose one tenth of the contents of a grain of good wheat is more than suf-

---

* By a careful analysis in the wet-way, conducted by Mr. Davy, Professor at the Royal Institution, 100 parts of

	Gluten.	Starch.	Insoluble Matter.
Best Sicilian wheat afforded,	20	75	5
Good English wheat of 1803,	19	77	4
Spring wheat of 1804,	24	70	6
Blighted wheat of 1804,	13	52	35

The loss to the miller, from the increase of absolutely insoluble matter, or broad bran, is, when compared with good English wheat,

In Blighted wheat - -	31 per cent.
In Spring wheat only - -	2 per cent.

ficient. The quantity of flour in wheat has been increased by culture and management calculated to improve its qualities for the benefit of mankind, in the same proportion as the pulp of apples and pears has been increased, by the same means, above what is found on the wildings and crabs in the hedges.

It is customary to set aside or to purchase for seed corn, the boldest and plumpest samples that can be obtained; that is, those that contain the most flour: but this is unnecessary waste of human subsistence; the smallest grains, such as are sifted out before the wheat is carried to market, and either consumed in the farmer's family, or given to his poultry, will be found by experience to answer the purpose of propagating the sort from whence they sprung, as effectually as the largest.

Every ear of wheat is composed of a number of cups placed alternately on each side of the straw; the lower ones contain, according to circumstances, three or four grains, nearly equal in size, but towards the top of the ear, where the quantity of nutriment is diminished by the more ample supply of those cups that are nearer the root, the third or fourth grain in a cup is frequently defrauded of its proportion, and becomes shrivelled and small. These small grains, which are rejected by the miller, because they do not contain flour enough for his purpose, have nevertheless an ample abundance for all purposes of vegetation, and as fully partake of the sap, (or blood, as we should call it in animals,) of the kind which produced them, as the fairest and fullest grain that can be obtained from the bottoms of the lower cups, by the wasteful process of beating the sheaves.

POSTSCRIPT, 1806.

The argument in favour of sowing small grains of corn taken from an ear of a good sort, is not founded on conjecture; it has been deduced from a variety of experiments tried with different kinds of seeds; fortunately for the investigation of truth, it has met with opponents, who have combated it with theoretical arguments, and censured it severely, without adducing one experiment to contradict it; the consequence has been, that some old experiments have been recollected, and several new ones tried, some of them no doubt by persons prejudiced in favour of its opponents; a part of these have been published, and several more privately communicated, not one however has yet been brought forward, the result of which does not tend to confirm the original statement.

It must, however, be remembered, that although the smallest grain of wheat taken from the ear of an approved kind, will, when sown, produce as good a sample as the plumpest grain of the same sort can do; seminal varieties may occasionally be produced, differing from the original sort by yielding smaller grains, the small corn thus produced, will mingle with the offal, and in time, if the offal corn is sown, alter the produce for the worse; this tendency, however, will always be detected, by an increase in the proportion of offal corn, by which the necessity of changing seed will be rendered obvious.

In seasons when wheat is cheap, this change may be made at small expense, and ought therefore to be resorted to, if the smallest suspicion of a deterioration is entertained; in dear seasons offal corn should be used for seed, first, because it saves much expense to the farmer, as bold seed corn is always at such times exorbitantly dear, and next, because the selling of such corn at market, instead of burying it in the ground for seed, brings a great profit to the individual, tends to diminish the market price, which all good men wish to lower when it becomes oppressive to the poor, and manifestly prevents a large transfer of national property from this to other countries.

Supposing the annual consumption of wheat in this island to be 8,000,000 of quarters, it will require at 2½ qrs. an acre, 3,000,000 of acres to produce that quantity: the seeding this extent of land, will consume about 1,000,000 quarters of seed corn. This quantity added to the public stock in a year of dearth, cannot fail to produce some effect in lowering the prices; if it is to be purchased from foreign nations, it will at the rate of £4 a quarter, cost £4,000,000 sterling, and at the weight of 56lb. a bushel only, employ 200,000 tons of shipping to bring it home.

The deficiency of the crop of 1804, was very great; the mildew was the principal cause of it; in some places the smut also prevailed, but in no considerable degree, the lowest land in all cases fared the worst, except when exposed to the immediate influence of the sea winds; the higher lands were less damaged, and in some places wholly escaped. The counties north of the Teese, were much less affected than the south, and Scotland escaped wholly.

On the Duke of Bedford's farm at Wooburn, the wheats were severely hurt, though by no means so entirely destroyed, as in the rich low countries.

By experiments tried under his Grace's orders, the following comparison was made between the crops of wheat of 1804, and those of the two preceding years:

	Number of Sheaves to a Load of 5 Bushels.	Produce of a Load in Flour from the Mill.
1802	84	250
1803	96	230
1804	120	196

which makes the deficiency of the year 1804, when compared with the crop of 1802, about 30 per cent. in the measure of the corn, and 26 per cent. in the weight of the flour. These added together give a total deficiency on the crop of 1804, of 56 per cent.

It is not unlikely from the situation of the Wooburn district, that its deficiency offers a reasonable average of the deficiency of the island, south of the Teese; considerable allowance must nevertheless be made in estimating the whole deficiency of the crop, as the counties north of Teese, the whole of Scotland, and the lands open to the sea escaped: it cannot, however, be doubted, that if we estimate the deficiency of wheat on an average of the whole island, at one third of a medium harvest, we rather under rate than exceed. If then we admit the annual consumption of the island, to be 800,000 of quarters, this deficiency will amount to 2,666,000 quarters. Yet, notwithstanding this immense deficiency, the prices, though high, never became exorbitant.

The importation between the 10th of October, 1804, and the same period of the year 1805, was 893,271 quarters of wheat, and 67,308 cwt. of wheat flour, in all not amounting to 1,000,000 of quarters, the remaining deficiency must have been made up by the stock in hand, which was considerable, and by the use of substitutes, which having been so severely inculcated by the late recurrences of dearth, was cheerfully, and almost universally resorted to, potatoes fortunately were abundant and cheap.

Notwithstanding all this, it is difficult on any usual mode of calculation, to judge why the prices were not raised higher, but it is remarkable, as has been hinted in pages 9 and 10, that years of blight never raise corn to so exorbitant a price, as is always demanded in case of a wet harvest*.

---

* The average price of wheat for the whole year, 1805, is estimated by my ingenious friend, Mr. A. Young, at 10s. 10d. a bushel. That of 1800, was 14s. 1d. and that of 1801, 14s. 8½d.; being the highest average price of which we have any account.

A LETTER TO SIR JOSEPH BANKS, BART.

ELTON, near Ludlow, March 20, 1806.

MY DEAR SIR,

IN consequence of the information I derived from letters I had the honour to receive from you, and from your little pamphlet on the Blight of Wheat, I made a few experiments in the course of the last summer, the result of which I take the liberty to send you. My observations are, however, of little value, and tend only to point out one amongst the many predisposing causes to which diseases of that kind probably owe their existence.

An opinion prevailing very generally in this, as in other districts, that the barberry tree communicates disease to wheat and other plants in its vicinity, I sowed, in the autumn of 1804, a row of wheat round a plant of that kind, which grew in my garden, the soil of which is a shallow loam or a limestone gravel; and I also sowed several small portions of seed of the same kind in a meadow, the soil of which was very similar to that of my garden, though situated at a considerable distance from it. All the plants continued perfectly healthy till the beginning of July, when those near the barberry bush showed evident symptoms of disease. Small elevated points, of paler colour than other parts of the plants, first appeared on the leaves and straws, occasioned by the epidermis having been raised by the growth of minute fungi under it. The increase of the disease was from this period extremely rapid, and in the course of a single week the straws were covered with yellow spots, exactly as they are delineated by Mr. Bauer.

Examining the barberry bush attentively, I found upon its fruit a species of fungus similar in colour to that on the straws of the wheat; but its seed vessels were larger, and more spherical. I was, however, much disposed to believe the parasitical plants of the same species, and that the difference in the form and size of the seed vessels arose only from the difference of the nutriment they derived from the wheat, and from the acrid juice of the barberry.

The plants of wheat, which grew at a distance from the barberry bush, remaining free from disease, I carried a branch of the barberry, with diseased fruit upon it, to one of them, and wetting it with water, I brushed the wheat plants with it, repeating this operation three successive days. I at the same time applied a part of the diseased straws which had grown near the barberry bush, to other plants of wheat, which were free from disease, leaving upon them so large a portion of the seeds and seed vessels of the mildew, as to be visible without the aid of a lens. In the course of ten days the plants of wheat, which I had endeavoured to infect by means of the barberry branches and fruit, became covered with disease, whilst those to which I had applied the mildewed straws were not sensibly affected. I attributed the health of these to the want of moisture necessary to make the seeds of the mildew vegetate, and I therefore sprinkled them plentifully with water in the three succeeding days; and at the end of ten days I found them all diseased as in the preceding cases.

As water had been applied in each of the preceding experiments, it became necessary to ascertain how far that fluid alone might be capable of inducing disease without the aid either of the barberry, or diseased straws; and I therefore, whilst repeating the experiment last described, sprinkled a remaining portion of plants at the same hour with water only; and I was not very much surprised to find that these became as much diseased, within the same period of time, as any of those I have described.

In each of the preceding experiments very cold water was applied early in the afternoon of a warm and bright day; and the ground in which the plants grew was also very dry. A considerable absorption, therefore, probably took place; and to this absorption and the effects of a sudden change of temperature, as secondary causes, I am disposed to attribute the appearance of the disease; but whether the seeds of the mildew were carried into the pores of the plants by the water, or existed there before, is a question which I shall not attempt to solve. The application of cold water to any plant on which the sun is shining strongly, is very injurious to its health, and therefore likely to give increased activity to any disease, to which the plant is subject.

In the last experiment there is not the slightest reason to believe that the disease was communicated by the barberry; and it may be doubted whether that plant contributed to produce the disease in any of the preceding cases; and indeed in any other instance: nevertheless, the opinion so generally entertained both in this kingdom and on the continent, by practical farmers, that barberry trees are injurious to corn, deserves very considerable attention; and though the parasitical plant found on the barberry may be dissimilar in some respects to that found on wheat, it must not be immediately decided that they are specifically different. The primrose, the cowslip, the oxlip, and the polyanthus, Linnæus states to be the same plant; and experiments I have made leave no grounds of doubt that they are the same; yet had these plants been nearly as minute as the fungi on the straws of wheat, they would for ever have been considered as distinct species.

Experiments, which I have annually been in the habit of making on pease, leave no grounds of doubt in my mind that want of moisture at the root, with excess of it on the leaves and stems, is one at least amongst the secondary causes of mildew in that plant. Every gardener knows that in autumn, when the ground is dry and the dews cold and heavy, the pease always become mildewed; and that the crop is in consequence rendered of small value at that season. But I have constantly succeeded in preserving the health of my autumnal crops of pease, in rendering them nearly as abundant in the end of September and beginning of October as in July; and as the method I have adopted may throw some light on the cause of the mildew in wheat, I shall describe it, with the hope that it may in some degree lead to the prevention of that disease.

When my ground is worked for an autumnal crop of pease, the mould is thrown on each side, so as to form a shallow trench, where the future row is to stand. Into this trench as much water is poured as the ground will readily absorb; and in the water thus used I have often dissolved a small portion of common salt with beneficial effects; and if any green weeds, or other succulent vegetable substance, capable of retaining moisture within the ground, can readily be obtained, it is pressed closely into the bottom of the trench, which is then filled, and the surface mould thoroughly soaked with water. The seeds are then sown on the surface of the ground, and the mould is thrown from each side over them; which mode of planting possesses considerable advantages at all seasons of the year. For the roots probably descend as deep into the ground as they do when the seeds are sown in the usual way, whilst the lateral roots spreading nearly horizontal, approach the surface of the ground at the base of the ridge, and there absorb moisture from the dews or slightest showers: it is, however, necessary to water the rows, if the weather be very hot and dry. Those varieties of the pea which root deep, and grow high, succeed best.

The preceding mode of culture cannot be applied to wheat; but nevertheless it may possibly tend to point out some improvement in the culture of that plant in soils subject to mildew. Refuse common salt might be tried to a considerable extent, at a small expense, and there cannot be a doubt that the legislature would facilitate the application of it by a modification of the present laws, should it be found productive of any beneficial effect. Clover leys have in this country generally afforded crops of wheat least injured by mildew; and therefore it appears probable that buck-wheat, or tares, or other green vegetable substances, ploughed in a short time before the wheat is sown on fallows, may promote the health of the succeeding crop. There appears also good reason to believe that much advantage might be derived from the formation or selection of early varieties of wheat, which, by ripening early, would escape the ill effects of the heavy dews of autumn, and in part the drought of summer.

In the culture of my own farm, I always plough deep and sow thin and early; and I have uniformly escaped every disease except smut; and my own experience and observation have perfectly satisfied me that that disease is transferred from the parent plant, and is to be avoided by proper choice and management of the seed corn. My farm, however, possesses the advantages of moderate elevation, where the dews are less heavy, and the variations of temperature less; the soil is strong, and considerably retentive of moisture, and on such soils wheat is least subject to disease. To the conversion of such soils to pasture, and of lighter soils to tillage, I fear we must attribute the prevalence of disease, the frequent failure of crops, and the consequent enormous importation of corn: and so many causes operate in conjunction, as bounties on pasture, and as taxes on tillage, and operate still more on the passions and prejudices of the farmer, than on his interest, that an increased conversion of our best wheat ground to pasture must be the certain and inevitable consequence; but the consideration of these points belongs to the legislator, rather than to the naturalist.

I am,

My dear Sir, &c.

T. A. KNIGHT.

EXPLANATION OF THE PLATE.

FIG. 1. A piece of the infected wheat straw—natural size: at *a* the leaf-sheath is broken and removed, to show the straw which is not infected under it.

Fig. 2. A highly magnified representation of the parasitic plant which infects the wheat: *a* in a young state; *b* full grown; *c* are two plants, bursting and shedding their seeds, when under water, in the microscope; *d* two plants burst in a dry state; *e* seems to be abortive; *f* seeds in a dry state; *g* a small part of the bottom of a pore, with some of the parasitic fungi growing upon it.

Fig. 3. A part of the straw of fig. 1, magnified.

Fig. 4. Part of fig. 3 at *a b*, more magnified.

Fig. 5. Part of a straw similar to fig. 3, but in its green state, and before the parasitic plant is quite ripe.

Fig. 6. A small part of the same more magnified.

Fig. 7. A highly magnified transverse cutting of the straw, showing the insertion of the parasite in the bark of the straw.

Fig. 8. A longitudinal cutting of the same; magnified to the same degree

Fig. 9. A small piece of the epidermis of a straw, showing the large pores which

receive the seed of the parasite; the smaller spots observable on the epidermis, are the bases of hairs that grow on the plant of the wheat whilst young; but which fall off when it ripens, magnified to the same degree as the preceding figures.

THE END.

BOOKS

ON

AGRICULTURE AND RURAL AFFAIRS,

Lately Published;

SOLD by

J. HARDING,

36, ST. JAMES'S STREET, LONDON.

1. AGRICULTURAL SURVEYS of the SEVERAL COUNTIES of ENGLAND, with Observations on the Means of Improvement, drawn up for the Consideration, and published under the Authority, of the Board of Agriculture *.
2. ALDERSON's ESSAY on the IMPROVEMENT of POOR SOILS, a new Edition. 8vo. 2s.
3. AITON on the ORIGIN, QUALITIES, and CULTIVATION of MOSS EARTH. 8vo. 3s. 6d,
4. THE AGRICULTURAL MAGAZINE, Published Monthly in Numbers. 1s. 6d.
5. ATKINSON's VIEWS of PICTURESQUE COTTAGES for Labourers, &c. with Plans. 4to. 1l. 1s.
6. BELL's ESSAY on LEASES, chiefly applicable to the Scotch Lease. 8vo. 15s.

* This Work abounds with the most important Statistical and Agricultural Information, and will form a most valuable Addition to every Country Library. The Volumes are accompanied with engraved Representations of Live Stock, Implements of Husbandry, Plans of Farm Buildings, useful Machines and Inventions, and a Variety of other Interesting Subjects. The Work complete consists of about 20 Vols. but the Survey of each particular County may be had separate.

7. BAILEY's TABLES for Purchasing and Renewing Leases. 8vo.
8. BURKE on the ANATOMY of the HORSE, and on SHOEING. 6s.
9. BEARBLOCK's ESSAY on TITHES, with an Estimate of the Value of every Crop in common Cultivation. 8vo. 2s. 6d.
10. SIR JOSEPH BANKS's SHORT ACCOUNT of the DISEASE in CORN, called, by Farmers, the BLIGHT, the MILDEW, and the RUST; with a Plate. A new Edition, with Additions, and a Letter on the Origin of Blight, by T. A. Knight, Esq.
11. THE BATH AGRICULTURAL SOCIETY's PAPERS. Vol. X. 8vo. with Plates. 8s.
12. BARTLEY (Secretary to the Bath Society) on the Conversion of PASTURE LAND into TILLAGE; on the MANUFACTURE of POTATOES into STARCH; and on the Utility of applying POTATOES as FOOD for SHEEP. 1s. 6d.
13. BARTLEY's LETTERS on Extending the GROWTH of FINE CLOTHING WOOL, by INTERBREEDING with SPANISH RAMS and BRITISH EWES. 2s.
14. BARBER's DESIGNS for FARM BUILDINGS, COTTAGES, &c. with a particular Description of an Economical Mode of Building, termed *Pisé*, long practised in France, and which would be attended with many Advantages if generally introduced into this Country; addressed to the Farming Society of Ireland. 4to. with Plates. 10s. 6d.
15. BARTELL's HINTS for PICTURESQUE IMPROVEMENTS of Ornamental Cottages and their Scenery, including some Observations on the Labourer and his Cottage, large 8vo. with Plates. bds. 10s. 6d.
16. BLAINE's OUTLINES of the VETERINARY ART, as applied to the Horse, Ox, Sheep, and Dog. 2 vols. with Plates. 1l. 5s.
17. BLAINE on the DISORDERS of DOGS. 12mo. 3s. 6d.
18. BRITISH GARDEN; a Catalogue of Hardy Plants, indigenous or cultivated in Great Britain. 2 vols. 8vo. 16s.
19. CARPENTER's SYSTEM of AGRICULTURE. 2 vols. 8vo. Plates. 1l. 1s.
20. COMBRUNE's THEORY and PRACTICE of BREWING. 8vo. 8s.
21. COMMUNICATIONS to the BOARD of AGRICULTURE, on Subjects relating to the Husbandry and Internal Improvement of the Country, 4 vols. 4to. 4l. 1s.
22. CULLEY's OBSERVATIONS on LIVE STOCK, with Directions for choosing and improving the best Breeds of Domestic Animals, with Plates. 8vo. New Edition. Price 6s.

23. CULLYER's TABLES, for Farmers, Millers, Thatchers, &c. &c. 2s. 6d.
24. DICKSON's SYSTEM of PRACTICAL HUSBANDRY, with Plates, 2 vols. 4to. 4l. 4s.
25. DECORATIONS for PARKS and GARDENS, Designs for Gates, Garden Seats, Alcoves, Temples, Baths, Entrance Gates, Lodges, Cattle Sheds, Green Houses, &c. &c. 8vo. sewed. 10s. 6d.
26. THE EARL of DUNDONALD's TREATISE, showing the intimate Connexion that subsists between Agriculture and Chemistry: addressed to the Cultivators of the Soil, 4to. 10s. 6d.
27. ELKINGTON's MODE of DRAINING LAND. Plates. 8vo. 6s.
28. ELSAM's ESSAY on RURAL ARCHITECTURE, illustrated with Original and Economical Designs. 4to. 1l. 11s. 6d.
29. EVELYN's SILVA and TERRA; a Discourse on Forest Trees and Timber. New Edition by Dr. A. Hunter. Plates. 2 vols. 4to. 3l. 3s.
30. THE FARMER's MAGAZINE; a Periodical Work, exclusively devoted to Agriculture and rural Affairs. 6 vols. 3l. 4s.
31. FARMER's DAILY JOURNAL and ACCOMPTANT, 4to. 7s.
32. FARM ACCOUNTS, consisting of Ruled Tables, for keeping Accompts of Receipts, Outgoings, &c. Stock, Labour, &c. &c.
33. FORBES's PRACTICE of HUSBANDRY. 8vo. 5s.
34. FORSYTH's PRINCIPLES and PRACTICE of AGRICULTURE, 2 vols. 8vo. with Plates. 1s. 1s.
35. ————, (Wm.) on the CULTURE and MANAGEMENT of FRUIT TREES, with Plates. 8vo. 12s.
36. GAME BOOK, enabling the Sportsman to keep an Account of Game, when and where killed, and other particulars, in the Manner of a Journal for the Pocket. 7s. 10s. 6d. or 1l. 1s.
37. GANDY's DESIGNS for COTTAGES, COTTAGE FARMS, and other RURAL BUILDINGS, including Entrance Gates, and Lodges; accompanied with Ground Plans, Estimates, and Descriptions. 4to. 43 Plates. Price 2l. 2s.
38. ———— RURAL ARCHITECT; consisting of various Designs for Country Buildings, Lodges, &c. with Descriptive Letter Press, Estimates, Ground Plans, &c. 4to. 2l. 2s.
39. GARRARD's PLATES, Descriptive of the Improved Breeds of British Cattle, folio. 2l. 12s. 6d. or coloured, 5l. 5s.
40. HARRISON on the ROT in SHEEP, and other Animals. 8vo. 2s.

41. HUNTER's [Dr. A.] GEORGICAL ESSAYS, 6 vols. Plates. 3l. 3s.

42. HUBER on the NATURAL HISTORY of BEES. 12mo. 5s. 6d.

43. IDEAS for RUSTIC FURNITURE, proper for Garden Chairs, Summer Houses, Hermitages, Cottages, &c. 8vo. 4s.

44. IMISON's ELEMENTS of SCIENCE and ART; or familiar Application of NATURAL PHILOSOPHY and CHEMISTRY to the Improvement of Arts and Manufactures. 2 vols. 8vo. with 30 Plates. New and much improved Edition. 1l. 5s.

45. KNAPP's REPRESENTATION of the BRITISH GRASSES, with 119 coloured Plates. 4to. 8l. 8s.

46. KEYS on the Management of BEES to the greatest Advantage, with Plates, 8vo. 6s.

47. LAWRENCE's GENERAL TREATISE on CATTLE, comprehending Breeding, Improvement, Diseases, &c. 8vo. 12s.

48. ——————— New FARMING CALENDAR. 8vo. New Edition.

49. ——————— COMPLETE LAND STEWARD. New Edition. 8vo. 10s. 6d.

50. LOUDON's OBSERVATIONS on PLANTATIONS, LANDSCAPE GARDENING, EMBANKING, &c. with Plates. 10s. 6d.

51. ——————— on an IMPROVEMENT in the Construction of HOT HOUSES. 8vo. with Plates. 12s.

52. LUCCOCK's ESSAY on the Nature and Properties of WOOL, with a Description of the English Fleece; pointing out the Objects to be attended to by the Grower for its Improvement. 12mo. 5s. 6d.

53. LUGAR's ARCHITECTURAL SKETCHES for Cottages and Rural Dwellings, and Villas in the Grecian, Gothic and Fancy Styles. 4to. with Plates. 1l. 11s. 6d.

54. LAING's HINTS for DWELLINGS, consisting of Original Designs for Cottages, Farm Houses, Villas, &c. with Plans to each. 4to. boards, 1l. 5s.

55. MALCOLM's COMPENDIUM of MODERN HUSBANDRY, 3 vols. 8vo. 1l. 16s.

56. MARSHALL's Present Practice of RURAL ECONOMY in the Six Agricultural Departments of England; containing the Management of Landed Estates, the Treatment of Woodlands, and the present Practice of Agriculture in each. 14 vols. 8vo. 4l. 12s. N. B, The Account of any particular Department or County may be had separate.

57. MARSHALL's PRACTICAL TREATISE on PLANTING and RURAL ORNAMENT. 2 vols. 16s.

58. MARSHALL's REVIEW of the LANDSCAPE, with Practical Remarks on RURAL ORNAMENT. 5s.

59. MARSHALL's TREATISE on the Purchase, Improvement, and Management of LANDED PROPERTY. 4to. 2l. 2s. The same abridged, with Plate. 8vo. 10s. 6d.

60. MALTON's ESSAY on BRITISH COTTAGE ARCHITECTURE, exemplified by Fourteen Designs, with their Plans, &c. large quarto, boards. 1l. 11s. 6d.

61. ——— DESIGNS for VILLAS, chiefly Gothic. 4to. 2l. 12s. 6d.

62 MIDDLETON's ARCHITECT and BUILDER's MISCELLANY; containing Designs in Architecture for Cottages, Farm, Country, and Town Houses, Green Houses, Stables, Garden Seats, &c. bound. 1l. 1s.

63. ——— PICTURESQUE and ARCHITECTURAL VIEWS for Cottages, Farm Houses, and Country Villas. Folio, with Plates. 1l. 1s.

64. ——— DESIGNS for GATES and RAILS, suitable to Parks, Pleasure Grounds, Balconies, &c. Also some Designs for Trellis Work. 8vo. 6s.

65. MILLER's COUNTRY GENTLEMAN's ARCHITECT. 4to. sewed. 10s. 6d.

66. MONK's AGRICULTURAL DICTIONARY, 3 vols. 8vo. 1l. 1s.

67. NICOL's PRACTICAL PLANTER; a Treatise on Forest Planting, &c. 8vo. 7s.

68. NUTSHELLS, or PLANS for SMALL VILLAS, with Plates. 8vo. boards. 6s.

69. PARKINSON's EXPERIENCED FARMER, embracing the whole SYSTEM of AGRICULTURE, BREEDING, &c. 2 vols. 1l. 1s.

70. ——— FARMER's TOUR in AMERICA, in 1798, 1799, and 1800, giving a particular Account of the American System of Husbandry, &c. &c. 2 vols. 8vo. 15s.

71. ——— ENGLISH SYSTEM of FARMING, exemplified in the Management of an Estate in Ireland, belonging to the EARL of Conyngham, with Plates. 8vo.

72. A PRACTICAL and EXPERIMENTAL INQUIRY into the NATURE and PROPERTIES of the DIFFERENT KINDS of MANURES. 2s.

73. PARKER's ESSAY on the Construction, Hanging, and Fastening of Gates. 8vo. with Engravings. 6s.

74. PHILLIPS's GENERAL HISTORY of INLAND NAVIGATION; containing a Complete Account of the CANALS already executed in England; with Practical Remarks and Plates. 8vo. 10s. 6d.

75. PLAW's FERME ORNEE, or RURAL IMPROVEMENTS, suited to Parks, Plantations, Rides, Walks, Rivers, Farms, &c. boards. 1l. 11s. 6d.

76. ——— RURAL ARCHITECTURE, or Designs from the simple Cottage to the decorated Villa. 4to. half bound, 2l. 2s.

77. PLAW's SKETCHES for COUNTRY HOUSES, VILLAS, and RURAL DWELLINGS; calculated for Persons of moderate Income. Also some Designs for Cottages, which may be constructed of the simplest Materials. 4to. boards, 1l. 11s. 6d.
79. PONTEY's FOREST PRUNER, and TIMBER OWNER's ASSISTANT, a Treatise on the Management of British Timber. 8vo. with Plates. 12s.
80. ———— Profitable PLANTER, a new Edition, with Additions and Plates.
81. REPTON's OBSERVATIONS on the Theory and Practice of LANDSCAPE GARDENING; tending to establish fixed Principles in the Art. 4to. with many curious coloured Plates. A new Edition, boards. 5l. 5s.
82. REPTON on CHANGES of TASTE in LANDSCAPE GARDENING, &c. 8vo. 5s.
83. RENTON's GRAZIER's READY RECKONER, or Useful Guide in Buying and Selling Cattle. Fourth Edition. 2s. 6d.
84. SOANE's SKETCHES for COTTAGES, VILLAS, &c. to which are added six Designs for Improving and Embellishing Grounds, on 54 Plates, half bound, 2l. 12s. 6d.
85. ———— DESIGNS in ARCHITECTURE; consisting of Plans for Temples, Baths, Cassines, Pavilions, &c. for decorating Pleasure Grounds, Parks, Forests, &c. &c. Engraved on 38 Copper-Plates. 8vo. sewed. 6s.
86. SHEPHERD of BANBURY's RULES for Foretelling Changes of Weather. 1s. 6d.
87. SUGDEN's LAWS of BUYING and SELLING ESTATES. 8vo. 10s. 6d.
88. SIR JOHN SINCLAIR's ESSAYS on Subjects connected with Agriculture 8vo. 9s.
89. SPEECHLY's TREATISE on the CULTURE of the VINE, with Plates. A new Edition Improved. 18s.
90. STICKNEY's OBSERVATIONS respecting the GRUB. 8vo. A new Edition. 2s.
91. TWAMLEY's Complete PRACTICE of DAIRYING and CHEESE MAKING, laid down from thirty Years Experience. Second Edition. 8vo. 2s.
92. TREATISE on the CULTURE of POTATOES, showing the best Means of obtaining productive Crops. 1s.
93. WHITE on HORSES, 2 vols. with Plates. 11s.
94. WRIGHT's GROTESQUE ARCHITECTURE; consisting of Plans for Huts, Summer and Winter Hermitages, Retreats, Grottos, Cascades, Rustic Seats, Green Houses, &c. 8vo. 4s. 6d.
95. ———— ART of FLOATING LAND, with Plates. 8vo. 3s.
96. YOUNG's FARMER's CALENDAR, showing the Business to be performed on different kinds of Farms during every Month in the Year. A new Edition. 8vo. 10s. 6d.

96. YOUNG's ANNALS of AGRICULTURE, and other Useful Arts, with Plates; published in Numbers, Quarterly. 3s. 6d.

A CATALOGUE of BOOKS on AGRICULTURE and RURAL ECONOMY; including some Authors on POLITICAL ECONOMY, and the ARTS more immediately relating to RURAL AFFAIRS.

*** *Of J. HARDING may be had a Variety of other Publications on the above Subjects; and every New Work as soon as it appears.*

Savage & Easingwood, Printers,
Bedford Bury.